

CLAIMS

1. A compound comprising:
 - (A) two or more haptens conjugated by a spacer molecule; and
 - (B) one or more effector molecules conjugated by a linkage to the haptens or spacer molecule, wherein the linkage comprises one or more of an ester linkage, an imino linkage, an amino linkage, a sulfide linkage, a thiosemicarbazone linkage, a semicarbazone linkage, a hydrazone linkage, a hydrazine linkage, an oxime linkage, an ether linkage, an amide linkage or combinations thereof.
2. The compound of claim 1, wherein the linkage comprises an ester linkage.
3. The compound of claim 1, wherein the linkage comprises a sulfide linkage.
4. The compound of claim 1, wherein the linkage comprises a hydrazone linkage.
5. The compound of claim 1, wherein the linkage further comprises a cysteine residue, a penicillamine residue, a thiolactic acid residue, or derivatives thereof.
6. The compound of claim 5, wherein the linkage comprises a cysteine residue or derivative thereof and one or more of the effector

molecules are linked by an ester linkage to the cysteine residue or derivative thereof.

7. The compound of claim 5, wherein the linkage comprises a penicillamine residue or derivative thereof and one or more of the effector molecules are linked by an ester linkage to the penicillamine residue or derivative thereof.

8. The compound of claim 5, wherein the linkage comprises a thiolactic acid residue or derivative thereof and one or more of the effector molecules are linked by an ester linkage to the thiolactic acid residue or derivative thereof.

9. The compound of claim 1, wherein the haptens comprise a hard acid chelator, a soft acid chelator, or both.

10. The compound of claim 1, wherein the haptens comprise DTPA, HSG, or both.

11. The compound of claim 1, wherein the haptens comprise DTPA.

12. The compound of claim 1, wherein one or more haptens comprises DTPA and one or more haptens comprise HSG.

13. The compound of claim 11, further comprising indium cations.

14. The compound of claim 1, wherein the spacer molecule comprises a peptide.

15. The compound of claim 14, wherein the peptide comprises one or more D-amino acids.

16. The compound of claim 14, wherein the peptide comprises three or more amino acids.

17. The compound of claim 14, wherein the peptide comprises one or more lysine residues.

18. The compound of claim 14, wherein the peptide comprises one or more cysteine residues.

19. The compound of claim 14, wherein the peptide comprises one or more penicillamine residues or derivatives thereof.

20. The compound of claim 14, wherein the peptide comprises one or more thiolactic acid residues or derivatives thereof.

21. The compound of claim 14, wherein the peptide comprises one or more of the sequences R¹-Lys(X)-R²-Lys(Y) or Lys(X)- R²-Lys(Y)- R¹, wherein (X) and (Y) comprise the conjugated haptens, and wherein the effector molecule is conjugated to R¹, R², (X), or (Y).

22. The compound of claim 1, wherein the effector molecule comprises one or more drugs, prodrugs, toxins, enzymes, oligonucleotides, radioisotopes, immunomodulators, cytokines, hormones, binding molecules, lipids, polymers, micelles, liposomes, nanoparticles, or combinations thereof.

23. The compound of claim 22, wherein the binding molecule comprises an antibody or a fragment thereof.

24. The compound of claim 1, wherein the effector molecule comprises aplidin, azaribine, anastrozole, azacytidine, bleomycin, bortezomib, bryostatin-1, busulfan, calicheamycin, camptothecin, 10-hydroxycamptothecin, carmustine, celebrex, chlorambucil, cisplatin, irinotecan (CPT-11), SN-38, carboplatin, cladribine, cyclophosphamide, cytarabine, dacarbazine, docetaxel, dactinomycin, daunomycin glucuronide, daunorubicin, dexamethasone, diethylstilbestrol, doxorubicin, 2-pyrrolinodoxorubicine (2P-DOX), cyano-morpholino doxorubicin, doxorubicin glucuronide, epirubicin glucuronide, ethinyl estradiol, estramustine, etoposide, etoposide glucuronide, etoposide phosphate, floxuridine (FUDR), 3',5'-O-dioleoyl-FudR (FUDR-dO), fludarabine, flutamide, fluorouracil, fluoxymesterone, gemcitabine, hydroxyprogesterone caproate, hydroxyurea, idarubicin, ifosfamide, L-asparaginase, leucovorin, lomustine, mechlorethamine, medroprogesterone acetate, megestrol acetate, melphalan, mercaptopurine, 6-mercaptopurine, methotrexate, mitoxantrone, mithramycin, mitomycin, mitotane, phenyl butyrate, prednisone, procarbazine, paclitaxel, pentostatin, PSI-341, semustine streptozocin, tamoxifen, taxanes, taxol, testosterone propionate, thalidomide, thioguanine,

thiotepa, teniposide, topotecan, uracil mustard, velcade, vinblastine, vinorelbine, vincristine, ricin, abrin, ribonuclease, onconase, rapLR1, DNase I, *Staphylococcal* enterotoxin-A, pokeweed antiviral protein, gelonin, diphtheria toxin, *Pseudomonas* exotoxin, *Pseudomonas* endotoxin, an antisense oligonucleotide, an interference RNA, or combinations thereof.

25. The compound of claim 1, wherein the effector molecule comprises camptothecin or a derivative thereof.

26. The compound of claim 1, wherein the effector molecule comprises doxorubicin or a derivative thereof.

27. The compound of claim 1, further comprising an isotope selected from ^{18}F , ^{32}P , ^{33}P , ^{45}Ti , ^{47}Sc , ^{52}Fe , ^{59}Fe , ^{62}Cu , ^{64}Cu , ^{67}Cu , ^{67}Ga , ^{68}Ga , ^{75}Se , ^{77}As , ^{86}Y , ^{89}Sr , ^{89}Zr , ^{90}Y , ^{94}Tc , $^{94\text{m}}\text{Tc}$, ^{99}Mo , $^{99\text{m}}\text{Tc}$, ^{105}Pd , ^{105}Rh , ^{111}Ag , ^{111}In , ^{123}I , ^{124}I , ^{125}I , ^{131}I , ^{142}Pr , ^{143}Pr , ^{149}Pm , ^{153}Sm , $^{154\text{--}158}\text{Gd}$, ^{161}Tb , ^{166}Dy , ^{166}Ho , ^{169}Er , ^{175}Lu , ^{177}Lu , ^{186}Re , ^{188}Re , ^{189}Re , ^{194}Ir , ^{198}Au , ^{199}Au , ^{211}At , ^{211}Pb , ^{212}Bi , ^{212}Pb , ^{213}Bi , ^{223}Ra , ^{225}Ac , or combinations thereof.

28. The compound of claim 1, wherein the effector comprises a lipid.

29. A liposome or micelle comprising the compound of claim 28.

30. The liposome or micelle of claim 28, further comprising a drug or toxin.
31. An emulsion comprising the compound of claim 28.
32. The emulsion of claim 31 further comprising a drug or toxin.

33. A method of treating and/or diagnosing a disease or condition that may lead to a disease in a patient comprising:

- (A) administering to the patient a binding molecule, wherein the binding molecule has at least one arm that binds a targeted tissue and at least one other arm that binds a targetable construct;
- (B) optionally, administering to the patient a clearing composition and allowing the composition to clear non-localized binding molecules from circulation; and
- (C) administering to the patient a targetable construct comprising the compound of claim 1.

34. The method of claim 33, wherein the haptens comprise DTPA.

35. The method of claim 33, wherein one or more haptens comprises DTPA and one or more haptens comprise HSG.

36. The method of claim 33, wherein the compound further comprises indium cations.

37. The method of claim 33, wherein the spacer comprises a peptide.

38. The method of claim 37, wherein the peptide comprises one or more D-amino acids.

39. The method of claim 37, wherein the peptide comprises three or more amino acids.

40. The method of claim 37, wherein the peptide comprises one or more cysteine residues.

41. The method of claim 37, wherein the peptide comprises one or more penicillamine residues or derivatives thereof.

42. The method of claim 37, wherein the peptide comprises one or more thiolactic acid residues or derivatives thereof.

43. The method of claim 37, wherein the peptide comprises one or more lysine residues.

44. The method of claim 37, wherein the peptide comprises one or more of the sequences R¹-Lys(X)- R²-Lys(Y) or Lys(X)- R²-Lys(Y)- R¹, wherein (X) and (Y) comprise the conjugated haptens, and wherein the effector molecule is conjugated to R¹ or R².

45. The method of claim 33, wherein the linkage comprises an ester linkage.

46. The method of claim 33, wherein the linkage comprises a sulfide linkage.

47. The method of claim 33, wherein the linkage comprises a hydrazone linkage.

48. The method of claim 33, wherein the effector molecule comprises one or more drugs, prodrugs, toxins, enzymes, radioisotopes, immunomodulators, oligonucleotides, cytokines, hormones, antibodies, or combinations thereof.

49. The method of claim 33, wherein the effector molecule comprises aplidin, azaribine, anastrozole, azacytidine, bleomycin, bortezomib, bryostatin-1, busulfan, camptothecin, 10-hydroxycamptothecin, carmustine, celebrex, chlorambucil, cisplatin, irinotecan (CPT-11), SN-38, carboplatin, cladribine, cyclophosphamide, cytarabine, dacarbazine, docetaxel, dactinomycin, daunomycin glucuronide, daunorubicin, dexamethasone, diethylstilbestrol, doxorubicin, 2-pyrrolinodoxorubicin (2P-DOX), cyanomorpholino doxorubicin, doxorubicin glucuronide, epirubicin glucuronide, ethinyl estradiol, estramustine, etoposide, etoposide glucuronide, etoposide phosphate, floxuridine (FUdR), 3',5'-O-dioleoyl-FudR (FUdR-dO), fludarabine, flutamide, fluorouracil, fluoxymesterone, gemcitabine, hydroxyprogesterone caproate, hydroxyurea, idarubicin, ifosfamide, L-asparaginase, leucovorin, lomustine, mechlorethamine, medroprogesterone acetate, megestrol acetate, melphalan, mercaptopurine, 6-mercaptopurine, methotrexate, mitoxantrone, mithramycin, mitomycin, mitotane, phenyl butyrate, prednisone, procarbazine, paclitaxel, pentostatin, semustine streptozocin, tamoxifen,

taxanes, taxol, testosterone propionate, thalidomide, thioguanine, thiotepa, teniposide, topotecan, uracil mustard, vinblastine, vinorelbine, vincristine, ricin, abrin, ribonuclease, onconase, rapLR1, DNase I, *Staphylococcal* enterotoxin-A, pokeweed antiviral protein, gelonin, diphtheria toxin, *Pseudomonas* exotoxin, *Pseudomonas* endotoxin, an antisense oligonucleotide, an interference RNA, or combinations thereof.

50. The method of claim 33, wherein the effector molecule comprises camptothecin or a derivative thereof.

51. The method of claim 33, wherein the effector molecule comprises doxorubicin or a derivative thereof.

52. The method of claim 33, wherein the compound further comprises an isotope selected from ^{18}F , ^{32}P , ^{33}P , ^{45}Ti , ^{47}Sc , ^{52}Fe , ^{59}Fe , ^{62}Cu , ^{64}Cu , ^{67}Cu , ^{67}Ga , ^{68}Ga , ^{75}Se , ^{77}As , ^{86}Y , ^{89}Sr , ^{89}Zr , ^{90}Y , ^{94}Tc , $^{94\text{m}}\text{Tc}$, ^{99}Mo , $^{99\text{m}}\text{Tc}$, ^{105}Pd , ^{105}Rh , ^{111}Ag , ^{111}In , ^{123}I , ^{124}I , ^{125}I , ^{131}I , ^{142}Pr , ^{143}Pr , ^{149}Pm , ^{153}Sm , $^{154\text{m}}\text{Gd}$, ^{161}Tb , ^{166}Dy , ^{166}Ho , ^{169}Er , ^{175}Lu , ^{177}Lu , ^{186}Re , ^{188}Re , ^{189}Re , ^{194}Ir , ^{198}Au , ^{199}Au , ^{211}At , ^{211}Pb , ^{212}Bi , ^{212}Pb , ^{213}Bi , ^{223}Ra , ^{225}Ac , or combinations thereof.

53. The method of claim 33, wherein the effector molecule comprises an enzyme selected from the group consisting of carboxylesterases, glucuronidases, carboxypeptidases, beta-lactamases, phosphatases, and mixtures thereof.

54. The method of claim 33, wherein the binding molecule comprises an antibody or a fragment thereof.

55. The method of claim 54, wherein the antibody or fragment thereof is multispecific.

56. The method of claim 54, wherein the antibody or fragment thereof is multivalent.

57. The method of claim 54, wherein the antibody or fragment thereof is bi-specific.

58. The method of claim 54, wherein the antibody or fragment thereof comprises a monoclonal antibody or fragment thereof.

59. The method of claim 54, wherein the antibody or fragment thereof comprises a human, chimeric or humanized antibody or a fragment of a human, chimeric or humanized antibody.

60. The method of claim 54, wherein the antibody comprises Mab 679, Mab 734, Mab Mu-9, MN-14, or combinations thereof.

61. The method of claim 54, wherein the antibody comprises a fusion protein.

62. The method of claim 54, wherein the antibody comprises the CDRs of Mab 679, Mab 734, Mab Mu-9, Mab MN-14, or combinations thereof.

63. The method of claim 33, wherein the disease or condition comprises a malignant disease, a cardiovascular disease, an infectious disease, an inflammatory disease, an autoimmune disease, a metabolic disease, or a neurological disease.

64. The method of claim 63, wherein the disease or condition comprises a malignant disease and the targeted tissue comprises an antigen selected from the group consisting of carcinoembryonic antigen, tenascin, epidermal growth factor receptor, platelet derived growth factor receptor, fibroblast growth factor receptors, vascular endothelial growth factor receptors, gangliosides, HER/2neu receptors and mixtures thereof.

65. The method of claim 33, wherein the targeted tissue comprises a tumor.

66. The method of claim 65, wherein the tumor produces or is associated with antigens selected from the group consisting of colon-specific antigen-p (CSAp), carcinoembryonic antigen (CEA), CD4, CD5, CD8, CD14, CD15, CD19, CD20, CD21, CD22, CD23, CD25, CD30, CD45, CD74, CD80, HLA-DR, Ia, Ii, MUC 1, MUC 2, MUC 3, MUC 4, NCA, EGFR, HER 2/neu, PAM-4, TAG-72, EGP-1, EGP-2, A3, KS-1, Le(y), S100, PSMA, PSA, tenascin, folate receptor, VEGF, PIGF, ILGF-1, necrosis antigens, IL-2, IL-6, T101, MAGE, and combinations thereof.

67. The method of claim 33, wherein the targeted tissue comprises a multiple myleoma, a B-cell malignancy, a T-cell malignancy, or combinations thereof.

68. The method of claim 67, wherein the B-cell malignancy is selected from the group consisting of indolent forms of B-cell lymphomas, aggressive forms of B-cell lymphomas, chronic leukemias, multiple myeloma, and acute lymphatic leukemias.

69. The method of claim 33, wherein the targeted tissue comprises a lymphoma including a non-Hodgkin's lymphoma or a Hodgkin's lymphoma.

70. The method of claim 33, wherein the targeted tissue comprises a solid tumor.

71. The method of claim 70, wherein the solid tumor comprises a melanoma, a carcinoma, a sarcoma, a glioma, or combinations thereof.

72. The method of claim 71, wherein the carcinoma is esophageal, gastric, colonic, rectal, pancreatic, lung, breast, ovarian, urinary bladder, endometrial, cervical, testicular, renal, adrenal, liver cancer, or a combination thereof.

73. The method of claim 63, wherein the disease or condition comprises a cardiovascular disease and the antibody or antibody fragment is

specific for granulocytes, lymphocytes, monocytes, fibrin, D-dimer or a mixture thereof.

74. The method of claim 73, wherein the cardiovascular disease comprises myocardial infarction, ischemic heart disease, atheroschlerotic plaques, fibrin clots, emboli, or a combination thereof.

75. The method of claim 63, wherein the infectious disease is selected from the group consisting of a bacterial disease, fungal disease, parasitic disease, viral disease, protozoan disease, mycoplasmal, and combinations thereof.

76. The method of claim 63, wherein the infectious disease is caused by a pathogen selected from the group consisting of *Microsporum*, *Trichophyton*, *Epidermophyton*, *Sporothrix schenckii*, *Cryptococcus neoformans*, *Coccidioides immitis*, *Histoplasma capsulatum*, *Blastomyces dermatitidis*, *Candida albicans*, human immunodeficiency virus (HIV), herpes virus, cytomegalovirus, rabies virus, influenza virus, hepatitis B virus, Sendai virus, feline leukemia virus, Reovirus, polio virus, human serum parvo-like virus, simian virus 40, respiratory syncytial virus, mouse mammary tumor virus, Varicella-Zoster virus, Dengue virus, rubella virus, measles virus, adenovirus, human T-cell leukemia viruses, Epstein-Barr virus, murine leukemia virus, mumps virus, vesicular stomatitis virus, Sindbis virus,

lymphocytic choriomeningitis virus, wart virus, blue tongue virus, Anthrax bacillus, *Streptococcus agalactiae*, *Legionella pneumophilia*, *Streptococcus pyogenes*, *Escherichia coli*, *Neisseria gonorrhoeae*, *Neisseria meningitidis*, *Pneumococcus*, *Hemophilis influenzae B*, *Treponema pallidum*, Lyme disease spirochetes, *Pseudomonas aeruginosa*, *Mycobacterium leprae*, *Brucella abortus*, *Mycobacterium tuberculosis*, *Tetanus*, a helminth, a malaria parasite, *Plasmodium falciparum*, *Plasmodium vivax*, *Toxoplasma gondii*, *Trypanosoma rangeli*, *Trypanosoma cruzi*, *Trypanosoma rhodesiense*, *Trypanosoma brucei*, *Schistosoma mansoni*, *Schistosoma japonicum*, *Babesia bovis*, *Elmeria tenella*, *Onchocerca volvulus*, *Leishmania tropica*, *Trichinella spiralis*, *Onchocerca volvulus*, *Theileria parva*, *Taenia hydatigena*, *Taenia ovis*, *Taenia saginata*, *Echinococcus granulosus*, *Mesocestoides corti*, *Mycoplasma arthritidis*, *Mycoplasma hyorhinis*, *Mycoplasma orale*, *Mycoplasma arginini*, *Acholeplasma laidlawii*, *Mycoplasma salivarum*, *Mycoplasma pneumoniae*, and combinations thereof.

77. The method of claim 63, wherein the autoimmune disease is selected from the group consisting of acute idiopathic thrombocytopenic purpura, chronic idiopathic thrombocytopenic purpura, dermatomyositis, Sydenham's chorea, myasthenia gravis, systemic lupus erythematosus, lupus nephritis, rheumatic fever, polyglandular syndromes, bullous pemphigoid,

diabetes mellitus, Henoch-Schonlein purpura, post-streptococcalnephritis, erythema nodosum, Takayasu's arteritis, Addison's disease, rheumatoid arthritis, multiple sclerosis, sarcoidosis, ulcerative colitis, erythema multiforme, IgA nephropathy, polyarteritis nodosa, ankylosing spondylitis, Goodpasture's syndrome, thromboangitisobliterans, Sjogren's syndrome, primary biliary cirrhosis, Hashimoto's thyroiditis,thyrotoxicosis, scleroderma, chronic active hepatitis, polymyositis/dermatomyositis, polychondritis, parnphigus vulgaris, Wegener's granulomatosis, membranous nephropathy, amyotrophic lateral sclerosis, tabes dorsalis, giant cell arteritis/polymyalgia, pernicious anemia, rapidly progressive glomerulonephritis, psoriasis, fibrosing alveolitis, and combinations thereof.

78. The method of claim 63, wherein the disease or condition comprises a neurological disease or a metabolic disease and the targeted tissue comprises an amyloid deposit.

79. The method of claim 33, further comprising administering one or more therapeutic or diagnostic agents.

80. The method of claim 33, further comprising administering a therapeutic agent selected from antibodies, antibody fragments, drugs, prodrugs, toxins, enzymes, enzyme-inhibitors, nuclease, hormones, hormone antagonists, oligonucleotides, immunomodulators, cytokines, chelators,

boron compounds, uranium atoms, photoactive agents, radionuclides, and combinations thereof.

81. The method of claim 33, further comprising administering a cytokine selected from the group consisting of IL-1, IL-2, IL-3, IL-6, IL-10, IL-12, IL-18, IL-21, interferon- α , interferon- β , interferon- γ , G-CSF, and GM-CSF, and mixtures thereof.

82. The method of claim 33, further comprising administering an anti-angiogenic agent selected from the group consisting of angiostatin, endostatin, basculostatin, canstatin, maspin, anti-VEGF antibodies, anti-placental growth factor antibodies, anti-vascular growth factor antibodies, and mixtures thereof.

83. The method of claim 33, further comprising administering a diagnostic agent selected from radioisotopes, dyes, radioopaque materials, contrast agents, fluorescent compounds, enhancing agents, and combinations thereof.

84. The method of claim 33, further comprising administering a metal selected from zinc, aluminum, gallium, lutetium, palladium, boron, gandolinium, uranium, manganese, iron, chromium, copper, cobalt, nickel, dysprosium, rhenium, europium, terbium, holmium, neodymium, and combinations thereof.

85. The method of claim 33, further comprising administering a paramagnetic ion selected from chromium (III), manganese (II), iron (III), iron (II), cobalt (II), nickel (II), copper (II), neodymium (III), samarium (III), ytterbium (III), gadolinium (III), vanadium (II), terbium (III), dysprosium (III), holmium (III), erbium (III), or combinations thereof.

86. The method of claim 84, wherein the diagnostic agent comprises one or more agents for photodynamic therapy.

87. The method of claim 86, wherein the diagnostic agent is a photosensitizer.

88. The method of claim 87, wherein the photosensitizer comprises a benzoporphyrin monoacid ring A (BDP-MA), tin etiopurpurin (SnET2), sulfonated aluminum phthalocyanine (AlSPc) and lutetium texaphyrin (Lutex).

89. The method of claim 33, further comprising administering a therapeutic or diagnostic nuclide selected from the group consisting of ¹⁸F, ³²P, ³³P, ⁴⁵Ti, ⁴⁷Sc, ⁵²Fe, ⁵⁹Fe, ⁶²Cu, ⁶⁴Cu, ⁶⁷Cu, ⁶⁷Ga, ⁶⁸Ga, ⁷⁵Se, ⁷⁷As, ⁸⁶Y, ⁸⁹Sr, ⁸⁹Zr, ⁹⁰Y, ⁹⁴Tc, ^{94m}Tc, ⁹⁹Mo, ^{99m}Tc, ¹⁰⁵Pd, ¹⁰⁵Rh, ¹¹¹Ag, ¹¹¹In, ¹²³I, ¹²⁴I, ¹²⁵I, ¹³¹I, ¹⁴²Pr, ¹⁴³Pr, ¹⁴⁹Pm, ¹⁵³Sm, ¹⁵⁴⁻¹⁵⁸Gd, ¹⁶¹Tb, ¹⁶⁶Dy, ¹⁶⁶Ho, ¹⁶⁹Er, ¹⁷⁵Lu, ¹⁷⁷Lu, ¹⁸⁶Re, ¹⁸⁸Re, ¹⁸⁹Re, ¹⁹⁴Ir, ¹⁹⁸Au, ¹⁹⁹Au, ²¹¹At, ²¹¹Pb, ²¹²Bi, ²¹²Pb, ²¹³Bi, ²²³Ra, ²²⁵Ac, and mixtures thereof.

90. The method of claim 79, wherein the therapeutic agent comprises a therapeutic nuclide.

91. The method of claim 90, wherein the therapeutic nuclide comprises ^{32}P , ^{33}P , ^{47}Sc , ^{64}Cu , ^{67}Cu , ^{67}Ga , ^{90}Y , ^{111}Ag , ^{111}In , ^{123}I , ^{131}I , ^{142}Pr , ^{153}Sm , ^{161}Tb , ^{166}Dy , ^{166}Ho , ^{177}Lu , ^{186}Re , ^{188}Re , ^{189}Re , ^{211}At , ^{212}Pb , ^{212}Bi , ^{213}Bi , ^{223}Ra , ^{225}Ac , or mixtures thereof.

92. The method of claim 90, wherein the therapeutic nuclide emits 70 to 700 keV gamma particles or positrons.

93. The method of claim 79, wherein the diagnostic agent comprises a diagnostic nuclide.

94. The method of claim 93, wherein the diagnostic nuclide comprises ^{18}F , ^{52}Fe , ^{62}Cu , ^{64}Cu , ^{67}Cu , ^{67}Ga , ^{68}Ga , ^{86}Y , ^{89}Zr , ^{94}Tc , $^{94\text{m}}\text{Tc}$, $^{99\text{m}}\text{Tc}$, ^{111}In , ^{123}I , ^{124}I , ^{125}I , ^{131}I , or mixtures thereof.

95. The method of claim 93, wherein the diagnostic nuclide emits 25-4000 keV gamma particles and/or positrons.

96. The method of claim 79, wherein the diagnostic agent is used for performing positron emission tomograph (PET).

97. The method of claim 33, further comprising performing positron-emission tomography (PET).

98. The method of claim 79, wherein the diagnostic agent comprises one or more image enhancing agents and the method further comprises performing magnetic resonance imaging (MRI).

99. The method of claim 98, wherein the image enhancing agent comprises gadolinium ions, lanthanum ions, manganese ions, iron, chromium, copper, cobalt, nickel, fluorine, dysprosium, rhenium, europium, terbium, holmium, neodymium, or mixtures thereof.

100. The method of claim 79, wherein the diagnostic agent comprises one or more radiopaque agents or contrast agents for X-ray or computed tomography (CT).

101. The method of claim 79, wherein said radiopaque or contrast agents include barium, diatrizoate, ethiodized oil, gallium citrate, iocarmic acid, iocetamic acid, iodamide, iodipamide, iodoxamic acid, iogulamide, iohexol, iopamidol, iopanoic acid, ioprocemic acid, iosefamic acid, ioseric acid, iosulamide meglumine, iosemetic acid, iotasul, iotetric acid, iothalamic acid, iotroxic acid, ioxaglic acid, ioxotrizoic acid, ipodate, meglumine, metrizamide, metrizoate, propyl iodone, thallous chloride, or combinations thereof.

102. The method of claim 79, wherein said diagnostic agent comprises one or more ultrasound contrast agents.

103. The method of claim 102, wherein said ultrasound contrast agent includes a liposome or dextran.

104. The method of claim 103, wherein the liposome is gas-filled.

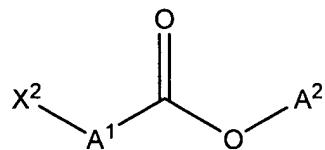
105. The method of claim 33, further comprising performing an operative, intravascular, laparoscopic, or endoscopic procedure.

106. The method of claim 33, wherein the binding molecule is administered intravenously and the targetable construct is administered orally.

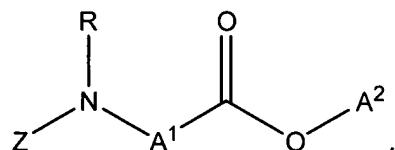
107. A method of preparing a polyalkylene polyamine substituted at one or more nitrogen positions with an alkyl carboxylate group, comprising:

reacting a polyalkylene polyamine having a formula $\text{NH}_2\text{-R}$ with a molecule having a formula Z-X^1 to form a molecule (I) having a formula Z-NH-R , wherein R is a straight chain or branched alkyl group that has between about 1 and about 20 carbon atoms and includes one or more nitrogen atoms, Z is a protecting group, and X^1 is a leaving group;

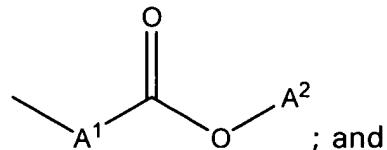
reacting molecule (I) with a molecule (II) having a formula:



wherein X^2 is a leaving group and A^1 and A^2 are straight chain or branched alkyl groups having between about 1 and about 12 carbon atoms, to form a molecule (III) having a formula:



wherein one or more nitrogen atoms within R are optionally substituted with a molecule having the formula:



removing and optionally replacing the protecting group Z.

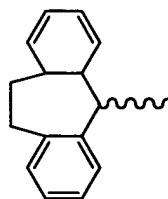
108. The method of claim 107, wherein the polyalkylene polyamine has the formula $\text{NH}_2\text{-}((\text{CH}_2)_V\text{-NH-}(\text{CH}_2)_W)_Y\text{-NH}_2$, wherein V, W, and Y are between about 1 and about 8 and are the same or different.

109. The method of claim 108, wherein the polyalkylene polyamine is diethylenetriamine.

110. The method of claim 107, wherein the protecting group Z comprises one or more aromatic groups.

111. The method of claim 110, wherein the protecting group Z comprises one or more benzene rings.

112. The method of claim 110, wherein the protecting group Z has the formula

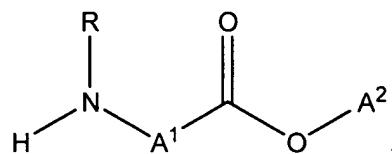


113. The method of claim 107, wherein Z is removed and replaced by a substituent that comprises one or more carbonyl or carboxyl groups.

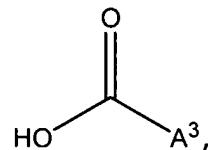
114. The method of claim 107, wherein Z is removed and replaced by reacting molecule (III) with H_2 and palladium.

115. The method of claim 114, wherein Z is removed and replaced by reacting molecule (III) and H₂ and palladium, and glyoxylic acid monohydrate.

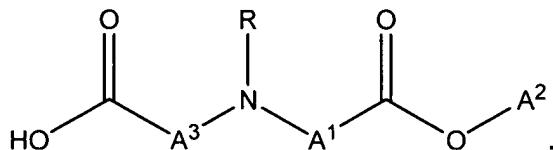
116. The method of claim 107, wherein Z is removed and replaced by H to form a molecule (IV) having a formula:



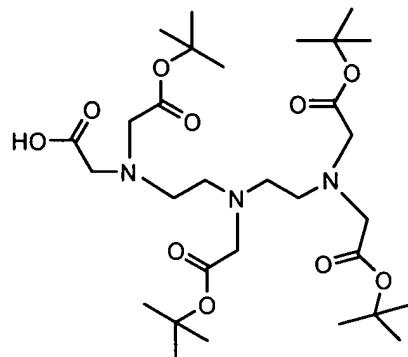
117. The method of claim 107, wherein Z is removed and replaced with a substituent having the formula:



wherein A³ is a straight chain or branched alkyl group having between about 1 and about 12 carbon atoms, to form a molecule (V) having a formula:



118. The method of claim 117, wherein molecule (V) has the formula:



119. The method of claim 107, wherein X¹ is halogen, mesylate or tosylate.

120. The method of claim 119, wherein X¹ is bromide or chloride.

121. The method of claim 107, wherein X² is halogen, mesylate or tosylate.

122. The method of claim 121, wherein X² is bromide or chloride.

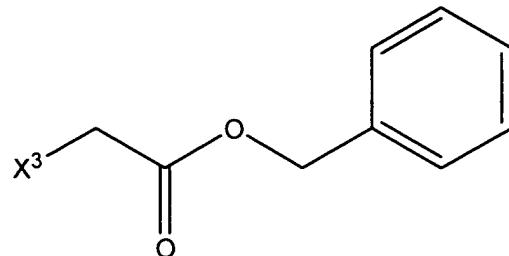
123. The method of claim 107, wherein A¹ is -CH₂-.

124. The method of claim 107, wherein A² is *tert*-butyl.

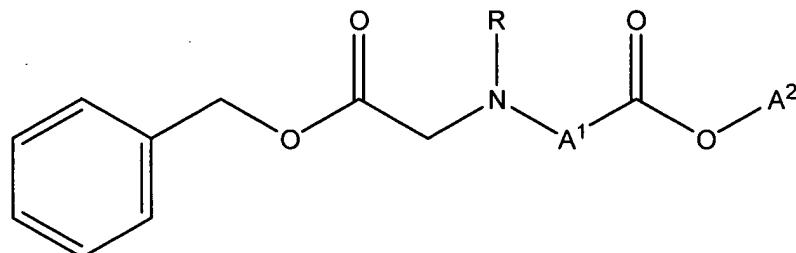
125. The method of claim 107, wherein removing Z comprises reacting molecule (III) with H₂ and palladium.

126. The method of claim 116, further comprising reacting molecule

(IV) with a molecule having the formula:

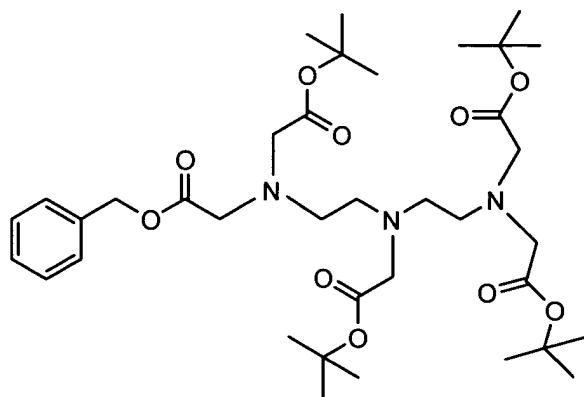


to form a molecule (VI) having the formula:



wherein X^3 is a leaving group.

127. The method of claim 126, wherein molecule (VI) has the formula:



128. The method of claim 126, further comprising reacting molecule (IV) with H₂ and palladium to form molecule (VI).

129. A method of preparing an N-alkylated polyalkylene polyamine having a protecting group attached predominantly to a single amine terminus, comprising:

reacting in a first reaction solution a polyalkylene polyamine having an amine terminus with a molecule comprising a protecting group to form a polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus;

extracting the polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus from the first reaction solution;

reacting in a second reaction solution the polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus with a first alkylating agent to form an N-alkylated polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus; and

extracting the N-alkylated polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus from the second reaction solution.

130. The method of claim 129, further comprising removing the protecting group.

131. The method of claim 130, where removing comprises reducing the N-alkylated polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus.

132. The method of claim 129, further comprising removing the protecting group attached predominantly to a single amine terminus to form an N-alkylated polyalkylene polyamine without the protecting group; and

reacting the N-alkylated polyalkylene polyamine without the protecting group with a second agent to form an N-alkylated polyalkylene polyamine with a second alkyl group attached predominantly to a single amine terminus.

133. The method of claim 132, wherein reacting the N-alkylated polyalkylene polyamine without the protecting group with a second agent to form an N-alkylated polyalkylene polyamine with a second alkyl group attached predominantly to a single amine terminus comprises reductive amination.

134. The method of claim 132, wherein the second agent is an alkylating agent.

135. The method of claim 129, wherein the N-alkylated polyalkylene polyamine having the protecting group attached predominantly to a single amine terminus is a peralkylated polyamine.